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The frequency and framing of cognitive lapses in healthy adults

Laura McWhirter* (Clinical Research Fellow)

Lachlan King (Medical Student)

Eilidh McClure (Medical Student)

Craig Ritchie (Professor of Psychiatry of Ageing)

Jon Stone (Professor of Neurology)

Alan Carson (Professor of Neuropsychiatry)

Centre for Clinical Brain Sciences, University of Edinburgh

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Author email addresses:

laura.mcwhirter@ed.ac.uk, s1505168@sms.ed.ac.uk, s1506238@sms.ed.ac.uk,
craig.ritchie@ed.ac.uk, jon.stone@ed.ac.uk, a.carson@ed.ac.uk

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Author contributorship

LM was responsible for study conception and design and for writing the final manuscript. LK and EM collaborated with LM, AC and CR in designing the questionnaire. LK and EM collected the data and wrote an early draft of the manuscript. AC, JS, and CR contributed equally to study design and subsequent review and revision of the manuscript.

ABSTRACT

Objective

Many people present to health services with concern about cognitive symptoms. In a significant proportion those symptoms are not the result of pathologically-defined brain disease. In some they are part of a Functional Cognitive Disorder. We assessed the frequency of cognitive lapses in a non-clinical sample in order to consider the utility of frequency of cognitive lapses in diagnosing cognitive disorders.

Methods

Healthy adults, who had never sought help for cognitive symptoms, completed a questionnaire, distributed via social media, about self-evaluation of cognitive function, frequency of specific cognitive lapses, and use of memory aids, including Schmitdke and Metternich's Functional Memory Disorder (FMD) inventory.

Results

124 adults, aged 18-59 (median 23), most with further or higher education, responded. 31(25%) reported 'fair' or 'poor' memory. 48(39%) reported memory worse than 5 years ago, and 30(24%) reported memory worse than others the same age. Participants endorsed a mean 13/18 specific cognitive lapses at least monthly. 111 (89%) scored ≥ 4 , the suggested cut off for the FMD inventory.

Conclusions

Cognitive lapses described in functional cognitive disorders are common in highly-educated adults. The high rate of reported lapses in this healthy population suggests that self-reported frequency of memory lapses alone cannot discriminate functional cognitive disorders from 'normal' cognitive experiences. Further research is required to clarify the role of abnormal self-evaluation of cognitive function (metacognition) in functional cognitive disorder. Better understanding of the factors moderating subjective interpretation of cognitive failures will also aid development of better clinical risk-stratification methods in people concerned about future dementia.

Keywords:

Cognition, Cognitive Dysfunction, Memory, Memory Disorders, Metacognition, Reference Values

Introduction

The last ten years have seen increasing societal and scientific drive to detect the neurodegenerative diseases causing dementia at the earliest stage, in the hope that, as effective treatments become available (including risk factor modification), it will be possible to ameliorate progression of these diseases and therein delay or prevent dementia onset. Yet, while increasing numbers of people present to health services concerned about memory problems, the percentage leaving memory clinics with a diagnosis of neurodegenerative brain disease is falling(1,2).

Discriminating clinical presentations which are likely to be due to neurodegenerative brain disease from those which are not is, therefore, an important clinical and research priority. In clinical practice, the assessment process includes interpretation of the patient's own report of their experience of cognitive difficulties. However, the relationship between self-perceived cognitive decline or inefficiency and brain disease is not straightforward. Subjective cognitive impairment is common in a range of populations, and studies of base rates of cognitive complaints are remarkable for the heterogeneity of results, depending on the cohort and also the questions asked(3–5). 'Do you have a memory problem?' is a very different question from 'Is your memory worse than five years ago?' and different again from 'Is your memory better or worse than other people the same age?'. Subjective cognitive decline (SCD) over time is associated with a slightly increased risk of future dementia over people without SCD, especially when tightly defined(6). Yet, the majority of those with SCD do not progress to dementia, and the presence of subjective cognitive impairment does not appear to correlate with age(7).

A Subjective Memory Complaints' Likert scale has been used in a number of studies, in which a memory rating of 'fair' or 'poor' in response to the question 'In general, how would you rate your memory?' is used as an indicator of the presence of Subjective Memory Complaints(SMC) (8,9). Of studies using this scale, Purser et al found that SMC did not predict progression of impairment in MCI, and Paradise et al found SMC in 12% of 45432 adults strongly related to psychological distress but not vascular risk factors(8,9). Larner found the

same indicator sensitive but not specific for an ultimate diagnosis of Functional Cognitive Disorder in patients attending a memory clinic(10).

Around a quarter of people attending memory clinics with cognitive complaints receive diagnoses in keeping with functional cognitive disorders (FCD)(7). In FCDs, cognitive symptoms are present, and associated with distress and/or disability, as the result of dynamic and therefore internally inconsistent changes in higher cognitive function, rather than progression of neurodegenerative disease(11). Research into FCD diagnosis has concentrated on how we might discriminate cognitive symptoms due to FCD from those due to brain disease. While raw scores on cognitive screening tests seem unhelpful one promising approach has involved analysis of interaction and language in the clinical examination(12). Another approach, employed in the FMD (functional memory disorder) inventory proposed by Schmidtke and Metternich, examines the frequency and nature of self-reported cognitive complaints(13).

In order to interpret the diagnostic relevance of self-reported cognitive complaints, it is important to understand the baseline frequency of comparable experiences in apparently healthy people. However, there have been very few studies of base rates of specific cognitive lapses in healthy populations. The largest healthy population included in McCaffrey et al's review of symptom base rates is from a 1987 study including a healthy control group of 620 US college students, of whom 9.7% experienced memory gaps (a gap in memory for an undefined period of time), 23% staring spells and 27% word-finding lapses(14,15). Another study included in the McCaffrey review was a 1995 study that included a group of 170 adults (mean age 38) of whom 32% forgot where the car is parked, 17% lost items around the house, and 27% forgot why they entered a room; although 40% of this group had an alcohol use disorder at 10 year follow-up suggesting possible confounders(16). There is therefore a lack of up-to-date data on cognitive symptom base rates in unselected healthy adults.

Although there is a well-developed body of research which differentiates the cognitive symptom profile and clinical presentation therein between FCD and people with dementia(7) there has been little analysis of the questions of how and why cognitive symptoms in FCD differ from cognitive lapses experienced by healthy people during everyday life. These are

important questions. Historically, some people within an FCD group have been described as ‘worried well’, in a way that has dismissed the extent of their cognitive disability and thereby seeming to justify not providing appropriate treatment. At the other end of this spectrum, a pervasive narrative in which subjective cognitive symptoms lie on a ‘one-way path’ to mild cognitive impairment and then dementia means that the fact that cognitive symptoms are really quite common is often lost. As a result, unwarranted prognostic significance may be placed on the presence of cognitive lapses which are a part of normal experience.

Understanding cognitive lapses in healthy adults, and how these are framed in terms of overall self-evaluation of cognitive function (metacognition), is an important preliminary step in the development of more accurate methods of clinical diagnosis and risk profiling in both degenerative brain disease and in functional cognitive disorders. In this study we therefore aimed to establish the frequency of, and interrelationships between, subjective memory complaint, specific cognitive lapses, and use of memory strategies, in healthy adults with a low risk of neurodegenerative brain disease.

Methods

An online questionnaire was advertised through a Facebook group for people living within a central area of Edinburgh (in the vicinity of Edinburgh University) with over 30,000 members, described as “a community board for those within walking distance of the Meadows to share resources, tools, skills, information etc.”

The questionnaire was open from January until late March 2020. Participants between 18-60 years were eligible. Exclusion criteria were: self-report of having sought medical advice for memory symptoms or having ‘ever been diagnosed with dementia or any other memory-related condition’. No incentive was provided for completing the questionnaire. Ethical approval was obtained from Edinburgh University, and no identifying information was collected.

The questionnaire asked participants about their perceptions of their own memory in general (‘In general, how would you rate your memory just now?’) using the SMC Likert scale as

described by Paradise et al, and respondents were considered to have Subjective Memory Complaints (SMC) if they rated memory 'Poor' or 'Fair' on this scale(9). Participants were also asked about their memory in comparison to others and to themselves 1 and 5 years ago, and compared with others the same age.

Participants were asked how frequently they experienced a range of memory lapses, and were also asked whether they experienced each lapse 'much more', 'more', 'about the same', 'less', or 'much less' than other people the same age. The questionnaire incorporated all components of the Schmidtke and Metternich (2009) short version FMD inventory(13)(**Appendix 1**). Additional lapses were included following discussion and consensus between the authors. In analysis of cognitive lapses, and of components of the FMD inventory, report of experiencing a lapse 'frequently (several times a week or more)', 'occasionally (about once a week)', or 'rarely (about once a month)', but not 'never', was interpreted as equivalent to 'yes' on the FMD inventory.

Questionnaire data was collected with Google Forms, and statistical analyses were performed using Excel (version 2007) and R (v3.6.0). Data were tested for normality using the Shapiro-Wilk test, and Spearman rank correlation coefficient and Wilcoxon rank sum tests were used in analyses of nonparametric data.

Results

Demographics

The survey was completed by 124 eligible participants, with a median age of 23 (range 18-59). 74% (92) were female, 24% (30) male and 1 'other'. 97% (120) were in or had completed further or higher education. 3 people self-reported ineligibility by responding 'yes' to the question 'Have you ever visited the doctor with concerns about your memory?'

General self-evaluation of memory

Table 1. Self-evaluation of memory

	Excellent	Very Good	Good	Fair	Poor
In general, how would you rate your memory?	13% (16)	32% (40)	30% (37)	19% (23)	6% (8)
	Much better	Better	Same	Worse	Much worse
How do you think your current memory is when compared to yourself 1 year ago?	2% (2)	4% (5)	81% (101)	13% (16)	0
How do you think your current memory is when compared to yourself 5 years ago?	2% (3)	10% (13)	48% (60)	31% (38)	8% (10)
How would you rate your memory compared to others your age?	10% (13)	27% (34)	38% (47)	22% (27)	2% (3)

Subjective memory complaint (SMC) was common: 25% (31/124) rated memory in general as 'Fair' or 'Poor' (**Table 1**).

There was no correlation between general rating of memory (the SMC Likert scale) and age ($r_s=-0.14, p=0.12$). There was a positive association between perceived memory decline over 1 and 5 years (chi square test, $df = 12, p<0.01$), but there was no correlation between subjective memory decline over the last 1 or 5 years and age ($r_s=0.03, p=0.71$; $r_s=0.11, p=0.24$); and there was no correlation between memory rating compared to others, and age ($r_s=-0.07, p=0.41$) (**Figure 1**).

Figure 1 - Self evaluation of memory function in 124 healthy volunteers, median age 23



Memory worry and fear of developing dementia

Forty-seven (38%) participants responded 'Yes' to the statement 'Are you worried about your memory?'; of whom four were 'very worried'. Seventy (56%) were 'afraid of developing dementia', including 16 (13%) who were 'very afraid'. Neither severity of memory worry or being 'afraid of developing dementia' correlated with age ($r_s=0.02$, $p=0.41$; $r_s=-0.06$, $p=0.49$) (Figure 1).

Twenty (17%) endorsed the statement 'When I forget something I fear that I may have a serious memory problem'. This correlated with memory worry ($r_s=0.41$, $p<0.001$) but not SMC Likert ($r_s=0.06$, $p=0.54$) or number of cognitive lapses endorsed ($r_s=0.01$, $p=0.99$).

Twenty one (17%) responded 'yes' to 'Has another person (e.g. friends/family) ever expressed concerns about your memory?'.

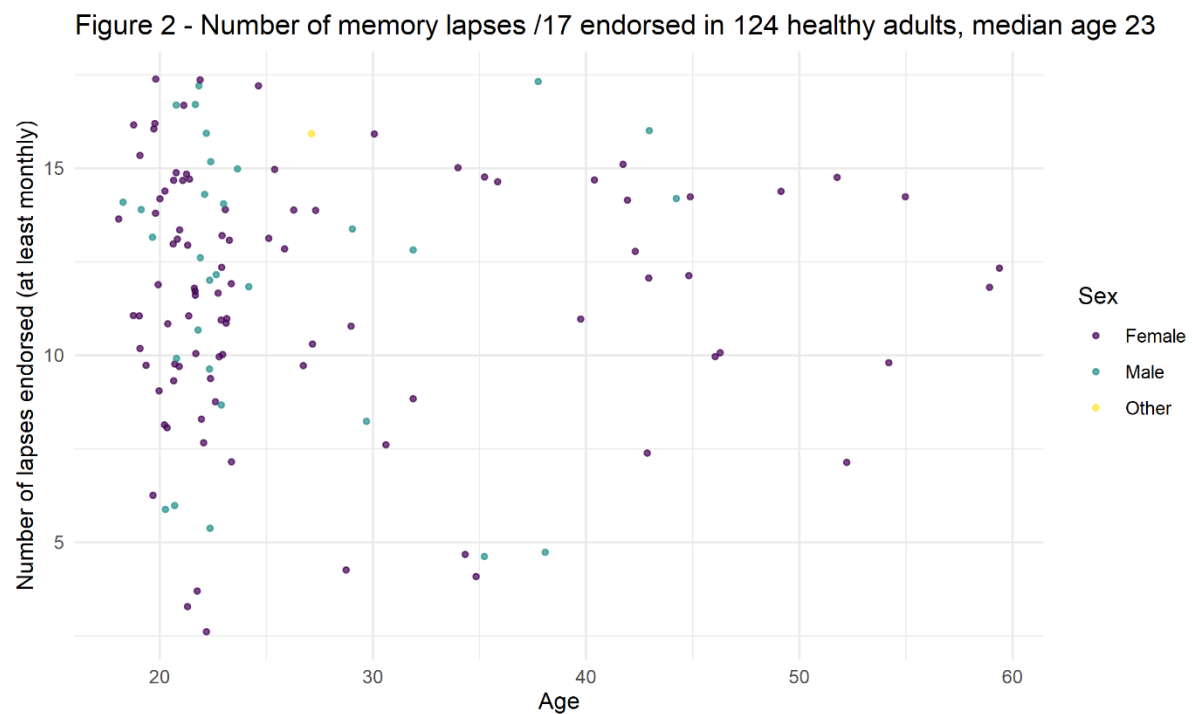
Frequency of specific cognitive lapses

Table 2 shows the reported frequency of cognitive lapses. 'Absent mindedness and daydreaming during conversation' was most frequent (several times a week or more in 29% and about once a week in another 28%), followed by word-finding difficulties (at least weekly in 56%), forgetting why one had entered a room (at least weekly in 50%), and misplacing a mobile phone (at least weekly in 40%). Forgetting where one's car or bike is parked was the least frequently endorsed symptom, but was still experienced at least monthly in 33%.

Table 2 (N=124) Frequency of cognitive lapse / symptom in 124 healthy volunteers, median age 23 (% (n))

'How often do you...'	Frequently (several times a week or more)	Occasionally (about once a week)	Rarely (about once a month)	Never
experience absent mindedness and day-dreaming during conversations?*	27% (34)	28% (35)	30% (37)	14% (17)
experience difficulties finding the right word?*	22% (27)	34% (42)	31% (38)	13% (16)
forget why you have entered a room?	19% (23)	31% (38)	31% (38)	19% (24)
forget or misplace your mobile phone?	17% (21)	23% (29)	36% (45)	22% (27)
experience disruptions in the thread of thoughts in conversations?*	15% (19)	30% (37)	44% (54)	10% (12)
forget your shopping list or forget to buy items?	15% (18)	32% (40)	41% (51)	11% (14)
forget important contents of conversations, appointments and errands?*	13% (16)	20% (25)	38% (47)	27% (34)
experience difficulties understanding and registering the contents of news, reading and lectures?*	10% (13)	25% (31)	32% (40)	31% (38)
forget activities/events that happened the day before?	10% (13)	17% (21)	35% (44)	35% (44)
forget significant dates or birthdays?	10% (12)	12% (15)	41% (51)	35% (43)
rapidly forget essential parts of a personal or telephone conversation?*	7% (9)	14% (17)	41% (51)	36% (45)
forget or misplace your keys?	8% (10)	13% (16)	51% (63)	28% (35)
forget whether you have locked a door or turned off an appliance?	6% (8)	22% (27)	44% (55)	27% (33)
experience blocks of retrieval of well-known names, phone numbers, PIN codes etc?*	3% (4)	15% (18)	42% (52)	39% (48)
commit errors, or experience "blackouts" during routine activities at work, at home, whilst driving etc?*	2% (3)	14% (17)	27% (34)	55% (68)
forget errands on the way to their execution?*	2% (3)	14% (17)	39% (48)	43% (53)
forget where you have left your car or bike?	2% (2)	2% (3)	28% (35)	66% (82)
How often is your memory performance subject to variations, namely less marked during times of relaxation?*	6% (8)	21% (26)	28% (60)	24% (30)
* items included in the FMD short inventory (Schmidtke and Metternich)				

Number of lapses out of 17 ('subject to variation' being excluded) was counted for each participant. Participants with SMC endorsed significantly more cognitive lapses (at least monthly) – a median of 14 compared with 11 in those without SMC (Wilcoxon rank sum test $W=15376$, $p<0.001$). No participant with SMC endorsed fewer than 10/17 lapses. Number of lapses endorsed did not correlate with age (**Figure 2**).



Participants generally (69-97%) reported experiencing the lapses listed in Table 2 **as often or less often** than others the same age; outliers were 'disruptions in the thread of thought during conversations' and word finding difficulties which 52 (42%) and 50 (40%) respectively reported experiencing more often than others the same age.

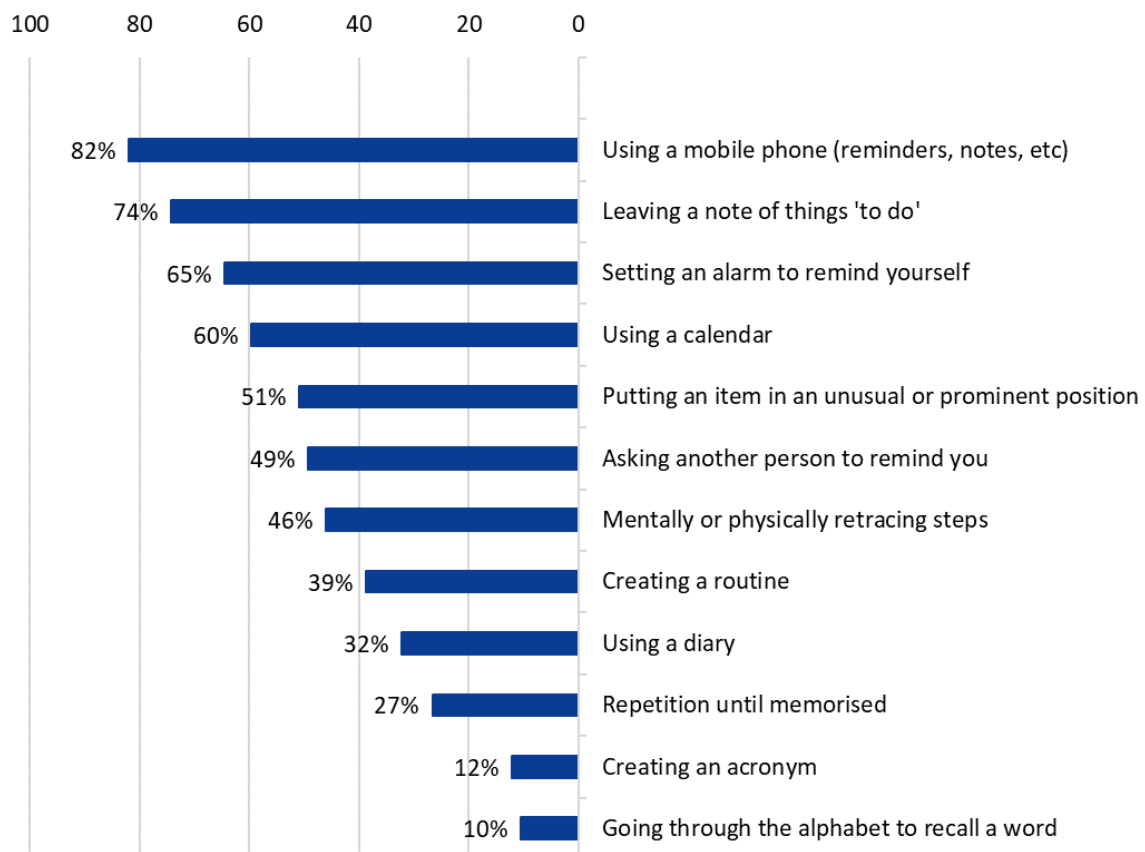
Memory aids and strategies

All participants had used at least one listed memory aid or strategy from those listed within the previous two weeks (**Figure 3**) The most frequently endorsed strategy was using a mobile phone to create electronic reminders or notes (82%). The number of memory aids or strategies used did not correlate with age ($r_s=-0.15$, $p=0.08$). Younger age was associated with greater use of repetition (Wilcoxon rank sum test $W = 2098.5$, $p=0.03$), but there were no other age associations between specific memory strategies. There was no significant

association between the number of aids used and the number of lapses endorsed (chi square test, $df = 140$, $p = 0.51$)

Figure 3 – Memory aids and strategies

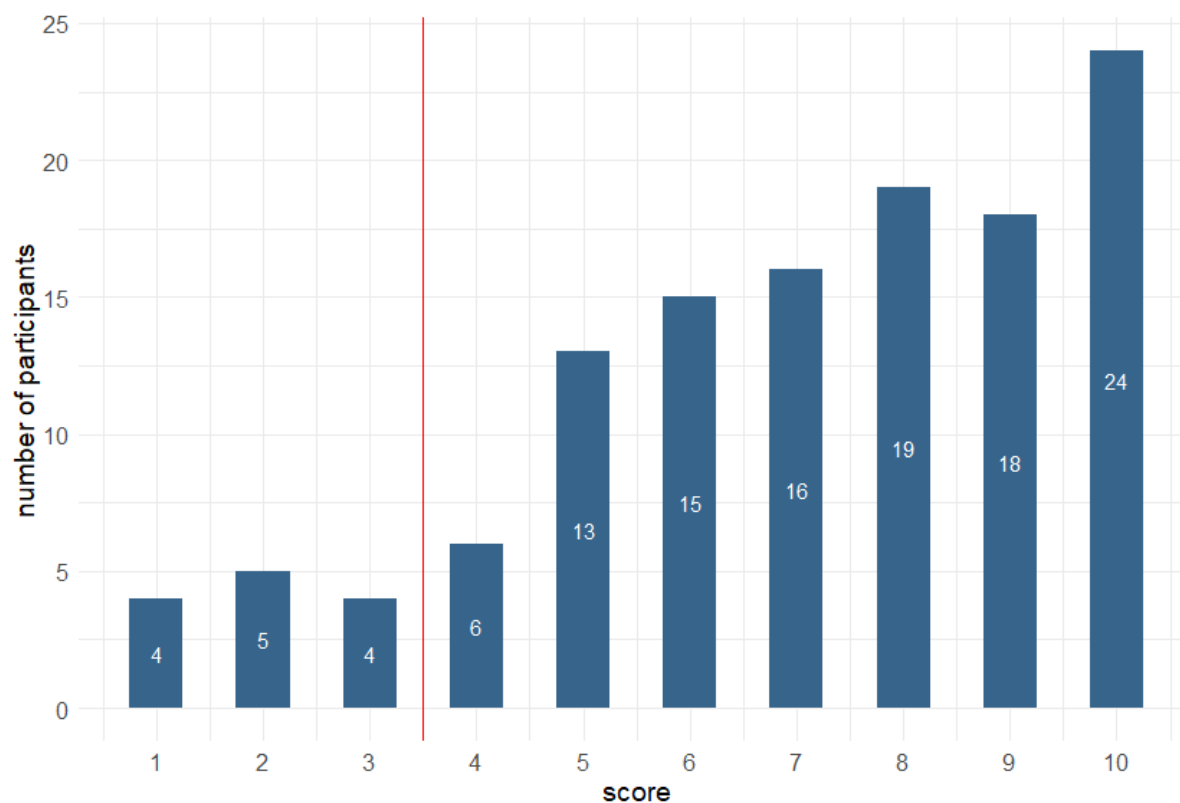
Memory strategies used in last 2 weeks by 124 adults (median age 23)



Functional Memory Disorder Inventory

Mean score on the short FMD inventory (**Appendix 1**) was 7 (SD 2.5), and no participant scored zero. Using Schmidtke and Metternich's suggested cut off score of ≥ 4 , 89% (110) of participants met Functional Memory Disorder criteria. **Figure 4** illustrates participants' scores on the FMD inventory. FMD score was inversely correlated with SMC Likert ($r_s = -0.42$, $p = 0.03$).

Figure 4 – Scores of 124 healthy adults (median age 23) on the Schmidtke and Metternich FMD short inventory.



Given this unexpectedly high proportion of FMD profiles, results were also calculated using an alternative method whereby each symptom was registered as present only if it was experienced at least once per week, instead of at least once per month. Using this method, the mean score was 3 (SD 2.6), and 22 (%) participants scored 0, but 55 (44%) still scored above the ≥ 4 cut off.

Discussion

The subjective experience of cognitive failure or inefficiency is very common. Using a Likert scale, previously described by Paradise and colleagues, 25% of this population of healthy adults, the majority of whom were in or had completed further or higher education, can be classified as having subjective memory complaints(8–10).

Perceived decline was also common, with 39% reporting that their memory was ‘worse’ or ‘much worse’ than five years previously, and did not correlate with age. However, participants tended to perceive their memory as being as good or better than others the same age,

particularly in relation to specific cognitive lapses. This paradoxical combination of perceived cognitive decline alongside 'illusory superiority' in comparison to others has also been observed in older adults(17).

Much of the subjective cognitive impairment and subjective cognitive decline literature is focussed on older adults, where it is more likely that degenerative brain disease and other pathophysiological processes may impact on cognitive function. However, our previous review of the wider literature found that subjective cognitive symptoms are common, present in a mean of 30% (range 8% - 80%) of non-clinical populations, and moreover that prevalence does not correlate with age, as would be expected if cognitive symptoms were primarily the result of degenerative brain disease(7). The high rate of subjective cognitive complaint and cognitive lapses in this population with a low risk of degenerative brain disease supports a view that the majority of cognitive lapses in the general population are not caused by brain disease. But while degenerative brain disease is overall an infrequent cause of cognitive lapses, they are nevertheless a source of worry. 38% of our participants were worried about their memory; more (56%) were afraid of future dementia.

Our participants endorsed having experienced a mean of 13 of the 18 suggested cognitive lapses at least once per month, and often several times per week. This is a helpful reminder that frequent memory lapses such as day-dreaming during conversation, walking into a room and forgetting what you went in for, or misplacing your phone are all commonly experienced several times a week by healthy and highly-educated adults. That is not to say that these experiences, presenting in a clinical setting, should be dismissed, as in some they may be part of a functional cognitive disorder, associated with cognition-focussed distress and disability, requiring accurate diagnosis and appropriate treatment. Having accurate and age-related data on particular cognitive experiences may be especially helpful in the context of designing specific therapies for functional cognitive disorder. These could be used to help reframe experiences and challenge metacognitions.

In this study, a striking 89% (110) of 124 non-complaining adult participants scored highly enough (≥ 4) on the FMD short inventory to meet criteria suggested by the authors of that inventory to suggest a diagnosis of Functional Memory Disorder had they presented with

impairment of function. In Schmidtke and Metternich's original 2009 validation study the FMD short inventory was administered to 50 healthy controls (mean age 49.5, 50% female) and 45 patients with Functional Memory Disorder (mean age 55.2). The control group in the 2009 study had a mean score of 0.8 (SD1) on the FMD short inventory, compared with 7.6 (SD2.6) in the FMD group, giving a specificity of 100% using a cutoff of ≥ 4 against the gold standard of FMD diagnosis made following non-blinded clinical examination according to the authors' FMD diagnostic criteria (13). In contrast, the participants in this younger and predominantly female 'healthy control' population scored much higher (mean score 7, SD 2.5).

Although our participants were younger and more predominantly female than Schmidtke and Metternich's healthy controls, and therefore in a group at slightly higher risk of functional neurological disorder, it would be quite wrong to assume that all of those scoring highly on the FMD inventory have Functional Cognitive Disorders. Allowing for the limitation of self-report, all denied diagnosed conditions affecting memory and none had consulted a health professional for memory problems. Moreover the 89% (or 44%) scoring above the suggested cut off on the FMD inventory study exceeds the proportion (25%) with subjective memory complaint (SMC). That is, many of our participants endorsed frequent memory lapses of different sorts, even though they overall rated their memory as good, very good, or excellent. This is at odds with our clinical experience of patients with functional cognitive disorders who are distressed by their symptoms and tend to overestimate their memory deficit.

We would argue instead that this study shows that the memory lapses included in the FMD inventory are experiences that fall within the normal range of experience. As Schmidtke and Metternich's make clear in the separate FMD diagnostic criteria used in the 'gold standard' in the FMD inventory validation study, these experiences become 'symptoms' only when they are accompanied by impaired function and distress(13).

This study supports a view that abnormalities in metacognition are key to the mechanism of FCD; cognitive lapses are not only experienced, but are experienced as problematic and distressing. In contrast, a large proportion of our population of healthy, highly educated, adults notice and acknowledge frequent cognitive lapses, without undue worry or concern,

whilst also believing their memory performance to be similar to or superior to others. This normalising (or even illusory superiority) alongside acceptance of failure and inefficiency appears important for healthy cognition.

The population studied here was heavily skewed towards a higher educational background. Most participants were in or had completed further or higher education. We speculate that this group might be expected to perform at a high level in psychometric tests, but also to be accustomed to a degree of self-scrutiny and social comparison against high internal standards. Study of more demographically diverse populations might help us to understand how educational participation and attainment influences both the experience and interpretation of common cognitive lapses.

So while evaluation of the nature and frequency of cognitive lapses has value in the evaluation of FCD in clinic, we suggest that this approach is best used in combination with a broader examination of what the person expects of their cognition, and how they interpret failures; and with other diagnostic methods such as observation and analysis of internally inconsistent patterns of performance and interaction(11,12). Future research might usefully examine the basis of and processes through which personal and shared interpretation of experienced cognitive failure and inefficiency might influence cognitive performance; in health, in functional disorders, and in degenerative brain disease.

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